Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition

Managing PCBs–Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training

Bay Area Stormwater Management Agencies Association

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This document is a deliverable of the Bay Area Stormwater Management Agencies Association (BASMAA) project *Managing PCBs−Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training*. BASMAA developed guidance, tools, and outreach and training materials to assist with San Francisco Bay Area municipal agencies' efforts to address the requirements of Provision C.12.f. of the Bay Area Municipal Regional Stormwater Permit (referred to as the MRP). Provision C.12.f of the MRP requires Permittees to manage PCBs–containing building materials during demolition.

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The material presented in this document is intended solely for the implementation of a municipal regulatory program required by the San Francisco Bay Area Regional Water Quality Control Board Municipal Regional Stormwater Permit for the protection of water quality under the Clean Water Act.

BASMAA prepared the tools and guidance herein to assist MRP Permittees' efforts to address the requirements of Provision C.12.f. of the MRP. The project team received input from a variety of stakeholders during development of the tools and guidance, including regulators (San Francisco Bay Regional Water Quality Control Board, U.S. EPA, and Bay Area Air Quality Management District staff), Bay Area municipal agency staff, and industry representatives.

This document does not address other environmental programs or regulations (e.g., PCBs regulations under the Toxic Substances Control Act (TSCA); federal, state, or local regulations for hazardous material handling and hazardous waste disposal; health and safety practices to mitigate human exposure to PCBs or other hazardous materials; recycling mandates; and abatement at sites with PCBs (or other contaminants). The applicant is responsible for knowing and complying with all relevant laws and regulations.

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1. INTRODUCTION

The San Francisco Bay Region Municipal Regional Stormwater NPDES permit, referred to as the Municipal Regional Permit (MRP)[1], includes provisions that implement stormwater-related aspects of the Total Maximum Daily Load (TMDL) for polychlorinated biphenyls (PCBs) in the Bay. Provision C.12.f. requires that Permittees develop and implement or cause to be developed and implemented an effective protocol for managing materials with PCBs concentrations of 50 milligrams per kilogram (mg/kg) (equivalent to parts-per-million, or ppm), the target management level, or greater in applicable structures at the time such structures undergo demolition[2], so that PCBs do not enter municipal storm drain systems. Applicable structures include, at a minimum, non-residential structures constructed or remodeled between the years 1950 and 1980 with building materials such as caulking and thermal insulation with PCBs concentrations of 50 ppm or greater. Single-family residential and wood frame structures are exempt. Also, a Permittee is exempt from this requirement if it provided evidence acceptable to the Executive Officer in its 2016/17 Annual Report that the only structures that existed pre-1980 within its jurisdiction were single-family residential and/or wood-frame structures.[3]

Permittees are required to develop a protocol by June 30, 2019 that includes each of the following components, at a minimum:

1. The necessary authority to ensure that PCBs do not enter municipal storm drains from PCBs-containing materials in applicable structures at the time such structures undergo demolition;
2. A method for identifying applicable structures prior to their demolition; and
3. Method(s) for ensuring PCBs are not discharged to the municipal storm drain from demolition of applicable structures.

By July 1, 2019 and thereafter, Permittees are required to:

- Implement or cause to be implemented the PCBs management protocol for ensuring PCBs are not discharged to municipal storm drains from demolition of applicable structures via vehicle track-out, airborne releases, soil erosion, or stormwater runoff.
- Develop an evaluation methodology and data collection program to quantify in a technically sound manner PCBs loads reduced through implementation of the protocol for controlling PCBs during demolition of applicable structures.

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[1] The Municipal Regional Stormwater Permit, Order No. R2-2015-0049, was adopted November 19, 2015.
[2] Demolition means the wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations (40 CFR., Part 61, Subpart M).
[3] The City of Clayton provided evidence to support an exemption from the requirement.

On behalf of MRP Permittees, the Bay Area Stormwater Management Agencies Association (BASMAA) is conducting a regional project to assist MRP Permittees to achieve compliance with Provision C.12.f. The regional project is developing guidance materials, tools, protocols and training materials and conducting outreach. The goal is to assist Permittees to develop local programs to prevent PCBs from being discharged to municipal storm drains due to demolition of applicable buildings. Local agencies will need to tailor the BASMAA products for local use and train local staff to implement the new program.

This document is the deliverable for Task 3 of the regional project, which is to develop a protocol for the assessment of prioritized PCBs-containing building materials prior to demolition. The full scope of work for the regional project is presented in the Project team's *Proposal for Tools, Protocol, Outreach & Training Work Plan: PCBs Materials Management during Building Demolition Project* (dated January 31, 2017; revised March 2017). If materials are found or known to contain PCBs, those materials must be managed appropriately and according to all applicable local, state, and federal requirements. Management of PCBs-containing materials is beyond the scope of this document.

To establishing the PCBs protocol, current established protocols were evaluated that are widely accepted in the building demolition industry for other Federal- and State-regulated constituents of concern. This document provides applicable examples of sampling and evaluation procedures for building materials potentially contaminated with asbestos-containing material (ACM)[4] and lead-based paint (LBP)[5], which are summarized and referenced to provide the foundation for the PCBs protocol. These components include guidance on sampling frequencies, laboratory sample analysis, quality assurance and quality control procedures, and reporting.

[4] Asbestos-containing material (ACM) means any material or product which contains more than one percent asbestos.

[5] Lead-based paint (LBP) is any paint, varnish, shellac, or other coating that contains lead equal to or greater than 1.0 mg/cm^2 as measured by XRF device or laboratory analysis, or 0.5 percent by weight (5,000 ppm or 5,000 mg/kg) as measured by laboratory analysis.

2. CURRENTLY ESTABLISHED BUILDING MATERIAL EVALUATION PROTOCOLS

This section presents evaluation protocols for ACM and LBP, which provide a foundation for the PCBs protocol summarized in Section 3. This section includes guidance on sampling frequencies, laboratory sample analysis, quality assurance and quality control procedures derived from regulatory procedures for ACM and LBP.

2.1 Asbestos Containing Material Evaluation Procedures

Asbestos bulk sampling procedures are specified in several Federal regulations, implemented primarily by the United States Environmental Protection Agency (EPA) as well as the Occupational Safety and Health Administration (OSHA). The Consumer Product Safety Commission (CPSC) and the Mine Safety and Health Administration (MSHA) specify additional regulations and procedures, but these are generally less applicable to evaluation procedures.

The foundational regulations pertaining to asbestos sampling in buildings are the Asbestos Hazard Emergency Response Act (AHERA; Toxic Substances Control Act [TSCA] Title II) (15 U.S.C. § 2641-2656) as well as the Asbestos School Hazard Abatement Reauthorization Act (ASHARA). EPA promulgated regulations under AHERA to require inspection of schools for asbestos-containing building materials, and to perform resultant corrective actions. Furthermore, AHERA tasked the EPA with developing a plan for accreditation of asbestos inspectors. ASHARA extended funding for asbestos programs at schools and expanded accreditation requirements to cover asbestos abatement at commercial buildings other than schools.

Pursuant to AHERA, the Asbestos-Containing Materials in Schools rule (40 CFR Part 763, Subpart E) details specific requirements for building material inspections at schools, preparation of asbestos management plans, and implementation of response actions. EPA regulation on asbestos related to structure demolition is specified in subpart M of the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations (40 CFR Part 61, Subpart M).

The following sections summarize the evaluation procedures specified in the Asbestos-Containing Materials in Schools rule as well as the Asbestos NESHAP regulations. Both OSHA and EPA worker protection requirements are also discussed.

2.1.1 Asbestos-Containing Materials in Schools Rule

The following sections summarize the inspection, re-inspection, sampling, analysis, and evaluation procedures specified in the Asbestos-Containing Materials in Schools rule (40 CFR Part 763, Subpart E).

Evaluation

For each inspection and re-inspection of asbestos-containing building material (ACBM)[6], the local education agency shall have an accredited inspector provide a written evaluation of all friable known or assumed ACBM. The evaluation shall consider the following:

- Location and amount of material, both in total quantity and as a percentage of the functional space;
- Condition of the material, specifying:
  - Type of damage or significant damage (e.g., flaking, blistering, water damage, or other signs of physical damage);
  - Severity of damage (e.g., major flaking, severely torn protective jackets, as opposed to occasional flaking, minor tears to jackets);
  - Extent or spread of damage over large areas or large percentages of the homogeneous[7] area;
- Whether the material is accessible;
- The material's potential for disturbance;
- Known or suspected causes of damage or significant damage (e.g., air erosion, vandalism, vibration, water); and
- Preventive measures that could potentially eliminate the reasonable likelihood of undamaged ACBM from becoming significantly damaged.

The inspector shall classify and give reasons in the written evaluation for classifying the ACBM and suspected ACBM assumed to be ACM into one of the following categories:

1. Damaged or significantly damaged thermal system insulation ACM;
2. Damaged friable surfacing ACM;
3. Significantly damaged friable surfacing ACM;
4. Damaged or significantly damaged friable miscellaneous ACM;
5. ACBM with potential for damage;
6. ACBM with potential for significant damage; and
7. Any remaining friable ACBM or friable suspected ACBM.

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[6] Asbestos-containing building material (ACBM) means surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building.

[7] Homogenous refers to a substance or area that is uniform in texture, color, and general physical appearance and properties.

Inspection and Re-inspection

Inspect any building that is to be used as a school, prior to such use, by an accredited inspector. In emergency situations, inspect the building within 30 days of commencement of such use.

For each area of the building, complete the following inspection procedure:

- Visually inspect the area to identify suspected ACBM;
- Touch suspected ACBM to determine friability (Friable material is material that may be crumbled or pulverized by hand pressure alone. Note that thermal system insulation that has retained its structural integrity and that has an undamaged protective jacket or wrap that prevents fiber release shall be treated as non-friable.);
- Categorize all areas into homogenous areas of friable suspected ACBM and non-friable suspected ACBM;
- Assume that some or all the homogeneous areas are ACBM, and for each homogeneous area that is not assumed to be ACBM, collect and submit samples for bulk analysis. Do not sample areas that an accredited inspector assumes to contain ACBM. For uncertain areas, collect and bulk samples and submit for analysis (see Sampling below);
- Assess friable material in areas where samples are collected, in areas where samples are not collected but ACBM is assumed to be present, and in areas identified in previous inspections;
- Record the following information and submit a copy for inclusion in an asbestos management plan, within 30 days of the inspection:
    - An inspection report including the signature, state of accreditation, and accreditation number of each inspector, as well as the date of the inspection;
    - A comprehensive inspection inventory, including the date and locations of samples, locations of areas assumed to contain friable ACBM, and locations of areas assumed to contain non-friable ACBM;
    - A description of the manner used to determine sampling locations;
    - A list of all categorized and identified homogenous areas into surfacing material, thermal system insulation, or miscellaneous material; and
    - Evaluations made of friable material.

Repeat this process as a re-inspection at least once every 3 years after a management plan is in effect. Reassess the condition of friable known or assumed ACBM previously identified. Identify any homogenous areas with material that has become friable since the last inspection or re-inspection and collect and submit samples of the material.

Sampling

Collect samples in a statistically random manner that is representative of each homogeneous area.

- For surfacing material, the number of samples to be collected is as follows:
    - Collect at least three samples from each homogenous area less than 1,000 square feet;
    - Collect at least five samples from each homogenous area between 1,000 and 5,000 square feet; and
    - Collect at least seven samples from each homogenous area greater than 5,000 square feet.
- For thermal system insulation:
    - Collect at least one bulk sample from each homogeneous area that is not assumed to be ACM;
    - Collect at least one bulk sample from each homogeneous area of patched insulation that is not assumed to be ACM, if the patched section is less than six linear or square feet;
    - Where cement or plaster is used on fittings such as tees, elbows or valves, collect samples to determine if material is ACM or not;
    - If the accredited inspector determines that the thermal system insulation is fiberglass, foam glass, rubber, or other non-ACBM, samples are not required to be collected;
- For miscellaneous material, collect bulk samples from each homogeneous area of friable material that is not assumed to be ACM.

Analysis

Samples should be analyzed by laboratories accredited by the National Bureau of Standards (NBS). The laboratories must have received interim accreditation for polarized light microscopy (PLM) analysis under the EPA Interim Asbestos Bulk Sample Analysis Quality Assurance Program until the NBS PLM laboratory accreditation program for PLM is operational.

Samples should be analyzed for asbestos content by PLM using the "Interim Method for the Bulk Determination of Asbestos in Bulk Insulation Samples", found at Appendix E to Subpart E of 40 CFR Part 763. Samples should not be composited.

A homogenous area is considered not to contain ACM only if the results of all samples from that area show asbestos in concentrations of 1 percent or less. An area is considered to contain ACM if at least one sample from the area shows asbestos in concentrations greater than 1 percent.

Submit the name and address of each laboratory performing the analysis, the date of the analysis, and the person performing the analysis for inclusion into the management plan within 30 days of the analysis.

2.2 Lead-Based Paint (LBP) Evaluation Procedures

Lead-Based Paint (LBP) evaluation procedures are codified in various federal and state regulations.

Title IV of the Toxic Substances Control Act (TSCA) as well as other authorities in the Residential Lead-Based Paint Hazard Reduction Act of 1992 directs the EPA to regulate lead-based paint hazards. The primary Federal regulations and guidelines related to LBP evaluation procedures include:

- The Lead Renovation, Repair and Painting Program (RRP) Rule (40 CFR 745, Subpart E);
- The National Lead Laboratory Accreditation Program (TSCA Section 405(b)); and
- The Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (2012 Edition) (pursuant to Section 1017 of the Residential Lead-Based Paint Hazard Reduction Act of 1992, A.K.A. "Title X")

Furthermore, the California Department of Public Health (CDPH) Title 17, California Code of Regulations, Division 1, Chapter 8 "Accreditation, Certification, and Work Practices for Lead-Based Paint and Lead Hazards," specifies some LBP evaluation procedures as part of the accreditation program.

The HUD Guidelines provide the most comprehensive procedures for LBP evaluations and are referenced by many other regulations.

There are three primary methods of performing LBP evaluation: test kits, X-ray Fluorescence (XRF) devices, and laboratory testing of paint chips. Sampling procedures for each method are detailed in the following sections.

Under CDPH Title 17, certified Lead Inspector/Assessors are required to use XRF devices or laboratory analysis, and not test kits.

2.2.1 LBP Sampling Procedures: Test Kits

In 2008, the EPA published the RRP rule, which, among other things, established criteria for lead test kits for use in LBP evaluation. Lead test kits recognized by EPA before September 1, 2010, must meet only the negative response criterion outlined in 40 CFR 745.88(c)(1):

> *For paint containing lead at or above the regulated level, 1.0 mg/cm^2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a negative response less than or equal to 5% of the time must be met.*

Lead test kits recognized after September 1, 2010, must meet both the negative response and positive response criteria outlined in 40 CFR 745.88(c)(1) and (2). The positive-response criterion states:

> *For paint containing lead below the regulated level, 1.0 mg/cm^2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a positive response less than or equal to 10% of the time must be met.*

To date, no lead test kit has met both criteria[8]. However, three lead test kits recognized before September 1, 2010, exist and are recognized by EPA:

- 3M™ LeadCheck™, manufactured by the 3M Company, for use on wood, ferrous metal, drywall, and plaster surfaces;
- D-Lead®, manufactured by ESCA Tech, Inc., for use on wood, ferrous metal, drywall, and plaster surfaces; and
- The Commonwealth of Massachusetts lead test kit, for use only on drywall and plaster surfaces.

Test kits cannot determine the concentration of lead, only presence or absence at best. For this reason, test kits are best used by homeowners or other non-professionals as a preliminary evaluation before using an XRF device or laboratory analysis of paint chips.

There are currently no detailed sampling procedures for test kits that would be applicable to PCBs evaluation. However, test kit technology may be a useful paradigm for PCBs evaluation if a kit can be developed to test PCBs at an acceptable concentration that uses a repeatable methodology to meet the data quality objectives.

2.2.2 LBP Sampling Procedures: XRF Devices

The following sections summarize LBP evaluation procedures for XRF devices, including description of sampling equipment, collection techniques and frequency, sample analysis, and quality assurance.

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[8] US EPA, Lead Test Kits, https://www.epa.gov/lead/lead-test-kits, accessed September 19, 2017.

LBP Analyzers

According to the HUD Guidelines, portable XRF devices are the most common primary analytical method for inspections in housing because of their versatility in analyzing a wide variety of surface types, non-destructive measurement, high speed, and low cost per sample. Each XRF device must have a HUD-issued XRF Performance Characteristic Sheet (PCS), which contains information about XRF readings taken on specific surface types, calibration check tolerances, and interpretation of XRF readings.

Collection Techniques and Frequency

HUD Guidelines provide separate sampling techniques for single- and multi-family housing. However, the general approach to sampling is the following seven-step procedure:

- List all testing combinations of building components and substrates (e.g., wood doors, metal doors, plaster walls, concrete walls);
- Select testing combinations. A numbering system, floor plan, sketch or other system may be used to document which testing combinations were tested;
- Perform XRF testing, including calibration;
- Collect and analyze paint-chip samples as needed;
- Classify XRF and paint-chip results;
- Evaluate the work and results to ensure the quality of the inspection; and
- Document the findings in a summary and in a complete technical report.

Because of the large surfaces and quantities of paint involved, and the potential for spatial variation, HUD Guidelines recommend taking at least four readings per room, with special attention paid to surfaces that clearly have different painting history. The selection of test locations should be representative of locations most likely to be coated with old paint or other lead-based coatings, such as areas with thick paint; areas with worn or scraped off paint should be avoided.

For large buildings with many similar units, HUD Guidelines recommend testing a designated sample of units to provide 95% confidence that most units are below the lead standard. The sample size should be carefully chosen using statistical techniques (see HUD Guidelines, Table 7.3).

Sample Analysis

Portable XRF devices expose a surface to X-ray or gamma radiation and measure the emission of characteristic X-rays from each element in the analyzed surface. The XRF reading is compared with a range specified in the PCS for the specific XRF device being used and the specific substrate beneath the painted surface.

When discrepancies exist between the PCS, HUD Guidelines, and the XRF device's manufacturer's instructions, the most stringent guideline should be followed.

Quality Assurance

HUD Guidelines provide several techniques for evaluation of inspection quality.

A knowledgeable observer independent of the inspection firm should be present for as much XRF testing as possible, especially if they have knowledge of LBP evaluation and/or the paint history of the facility.

The client should ask the inspector to provide copies of the results as soon as possible, or daily, allowing for immediate review.

Data from HUD's private housing lead-based paint hazard control program show that it is possible to successfully retest painted surfaces without knowing the exact spot which was tested. Therefore, the client may consider selecting 10 testing combinations for retesting at random from the already compiled list of all testing combinations, using the XRF device used for the original measurements, if possible. The average of the 10 repeat XRF results should not differ from the 10 original XRF results by more than the retest tolerance limit. The procedure for calculating the retest tolerance limit is specified in the PCS. If the limit is exceeded, the procedure should be repeated using 10 different testing combinations. If the retest tolerance limit is exceeded again, the original inspection is considered deficient.

Currently XRF technology and methods are not applicable to PCBs building material evaluation, as the precision is not adequate to provide a concentration that could be relied upon for this program.

2.2.3 LBP Sampling Procedures: Laboratory Testing of Paint Chips

The following sections summarize LBP evaluation procedures for XRF devices, including the description of sampling equipment, collection techniques and frequency, sample analysis, and quality assurance.

Laboratory analysis of paint chip samples is only recommended by HUD for inaccessible areas or building components with irregular (non-flat) surfaces that cannot be tested using XRF devices, for confirmation of inconclusive XRF results, or for additional confirmation of conclusive XRF results.

Unlike XRF analysis, paint chip collection techniques may be more directly applicable to potential PCBs collection techniques.

Sampling Equipment

Common hand tools can be used to scrape paint chips from a surface; specialized equipment is not necessary. However, HUD Guidelines recommend that samples should be collected in sealable rigid containers rather than plastic bags, which generate static electricity and make laboratory transfer difficult.

Collection Techniques

HUD Guidelines, which are consistent with ASTM E1729, Standard Practice for Field Collection of Dried Paint Samples for Subsequent Lead Determination, recommend that only one paint chip needs to be taken for each testing combination, although additional samples are recommended for quality control.

The paint chip sample should be taken from a representative area that is at least 4 square inches in size. The dimensions of the surface area must be accurately measured to the nearest $1/16^{th}$ of an inch so that laboratory results can be reported in units of mg/cm^2. Paint chip collection should include collection of all the paint layers from the substrate, but collection of actual substrate should be minimized. Any amount of substrate included in the sample may cause imprecise results.

Sample Analysis

A laboratory used for LBP analysis must be recognized under EPA's National Lead Laboratory Accreditation Program (NLLAP) for the analysis of lead paint; however, States or Tribes may operate an EPA-authorized lead-based paint inspection certification program with different requirements.

There are several standard laboratory techniques to quantify lead in paint chip samples, including Atomic Absorption Spectroscopy, Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES), Anodic Stripping Voltammetry, and Potentiometric Stripping Analysis.

For analytical methods that require sample digestion, samples should be pulverized so there is adequate surface area to dissolve the sample before laboratory instrument measurement. In some cases, the amount of paint collected from a 4-square-inch area may exceed the amount of paint that can be analyzed successfully. It is important that the actual sample mass analyzed not exceed the maximum mass the laboratory has successfully tested using the specified method. If subsampling is required to meet analytical method specifications, the laboratory must homogenize the paint chip sample (unless the entire sample will eventually be analyzed, and the results of the subsamples combined). Without homogenization, subsampling would likely result in biased, inaccurate lead results. If the sample is properly homogenized and substrate inclusion is negligible, the result can be reported as a loading, in milligrams per square centimeter (mg/cm^2), the preferred unit, or as percent by weight, or both.

Quality Assurance

Laboratory reference materials processed with the paint chip samples for quality assurance purposes should have close to the same mass as those used for paint-chip samples (refer to ASTM methods E1645, E1613, E2051, and E1775).

Reporting

The laboratory report for analysis of paint chip samples should include at a minimum, the information outlined in the EPA National Lead Laboratory Accreditation Program Laboratory Quality System Requirements, Revision 3.0, section 5.10.2, Test Reports[9]. In addition to those minimum requirements, test reports containing the results of sampling must include specified sampling information, if available.

[9] National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements https://www.epa.gov/sites/production/files/documents/lqsr3.pdf, accessed September 20, 2017.

3. PCBS BUILDING MATERIAL EVALUATION PROTOCOL

This section presents the evaluation protocol for identifying building materials in structures constructed or remodeled between the years 1950 and 1980[10] that may contain a significant mass of PCBs. Once identified as containing PCBs at concentrations exceeding 50 ppm, these materials should be properly managed prior to building demolition, to ensure PCBs are not discharged to the municipal storm drain system.

This protocol is not intended to address all PCBs-containing materials that may disturbed during building demolition. Additional sampling is likely to be required to comply with EPA and Cal/OSHA regulations pertaining to the management, removal and disposal of PCBs-containing materials.

For this program, it is assumed that organizations and staff qualified to sample, test, remediate, and dispose of PCBs at the building site will coordinate processes for other hazardous building materials at the building site, to ensure proper sampling, testing, remediation, and disposal or all statutorily-required hazardous materials handling.

3.1 Priority Building Materials to be Tested

A prioritized list of PCBs-containing materials is provided in Appendix A. Building materials were evaluated based upon the following criteria:

- **Source Material** – Does the building material contain PCBs through the original product manufacturing process or was the building material contaminated (impregnated) with PCBs from an adjacent building material that already contained PCBs? For the evaluation, building materials originally manufactured with PCBs at or above 50 mg/kg were prioritized.
- **Concentration** – Building materials were evaluated based on readily available existing data regarding ranges of PCBs concentrations identified in the materials.
- **Prevalence** – A prevalence factor was assigned based upon best professional judgement of the prevalence of occurrence of the PCBs-containing materials in buildings, which ranged from highly prevalent to low prevalence.
- **Ease of Removal –** Building materials were evaluated based on their attachment to the building, which ranged from "very easily removed" to "difficult to remove," under the assumption that higher ease of removal results in higher feasibility and lower costs for removing a material before demolition.

[10] Single-family residential and wood frame structures are exempt.

- **Flaking/Crumbling** – Building materials were evaluated based on their tendency to flake or crumble during disturbance or demolition, which could lead to a higher likelihood of entering stormwater as a result of building demolition.

- **PCBs Removed by Other Waste Program –** This factor addresses materials that are removed from buildings because of other waste management programs (e.g., Universal Waste Rule). Fluorescent light ballasts[11], polyurethane foam furniture, and Askarel fluid used in transformers, all of which may contain PCBs, are typically managed during pre-demolition activities under current regulations and programs that require removal of universal waste and outdated transformers. For this program it is assumed that those materials will be evaluated and managed under those existing programs.

Material prioritization was conducted by assigning a score on a scale of 1 to 5 (low to high) for each criterion. The final score for each material type was calculated as the average of the scores assigned to the six criteria. The materials given the highest scores through the prioritization analysis are shown below, along with their typical locations in a building. For this evaluation, thermal insulation and fiberglass insulation were grouped together as they tend to be co-located and are typically managed together. The materials listed below (along with typical locations where they are found) are the materials that should be sampled using the protocols described in Section 3.2.

1. Caulks and Sealants:
   a. Around windows or window frames;
   b. Around door frames; and
   c. Expansion joints between concrete sections (e.g., floor segments).
2. Thermal/Fiberglass Insulation and Other Insulating Materials:
   a. Around HVAC systems,
   b. Around heaters,
   c. Around boilers,
   d. Around heated transfer piping, and
   e. Inside walls or crawls spaces.
3. Adhesive/Mastic:
   a. Below carpet and floor tiles;

[11] Fluorescent light ballasts that contain PCBs are not required to be managed under the Universal Waste Rule Program but are recommended by the EPA to be identified in a pre-demolition survey of a structure and to be managed with the removal of other required wastes in the abatement process.

   b. On, under, or between roofing materials and flashing.

4. Rubber Window Seals/Gaskets:
   a. Around windows or window frames.

Examples of the prioritized PCBs-containing building materials and what they may look like in a building planned for demolition are provided in Appendix B.

3.2 PCBs Sampling Procedures

Many building materials may contain PCBs. The building owner is responsible for identifying and handling all hazardous materials in accordance with all applicable laws, including all materials with 50 ppm or more PCBs. For purposes of obtaining a demolition permit, the City requires a building owner to sample the limited number of materials shown below:

1. Caulks and Sealants:
   a. Around windows or window frames;
   b. Around door frames; and
   c. Expansion joints between concrete sections (e.g., floor segments).
2. Thermal/Fiberglass Insulation and Other Insulating Materials:
   a. Around HVAC systems,
   b. Around heaters,
   c. Around boilers,
   d. Around heated transfer piping, and
   e. Inside walls or crawls spaces.
3. Adhesive/Mastic:
   a. Below carpet and floor tiles;
   b. On, under, or between roofing materials and flashing.
4. Rubber Window Seals/Gaskets:
   a. Around windows or window frames.

It should be noted that some materials that are being evaluated for PCBs in this protocol may also be associated with asbestos, lead, or other hazardous substances. Since this protocol follows pre-established asbestos management program guidelines and procedures, the sampling frequency, types of building materials, and surveying techniques overlap with the PCBs survey protocol. If a

material has been determined to contain asbestos, lead or other hazardous substances and will be abated under an associated waste program, that material need not be sampled for PCBs under this program.

3.2.1 Sampling Equipment

Building materials that are planned to be collected for laboratory analysis should be placed in laboratory-supplied glass jars with Teflon-sealed lids. Samples should be collected with either factory-sealed or decontaminated equipment that will be used to remove a representative building material sample (i.e., scissors, tweezers, pliers, spoons, or putty knife).

For sampling equipment (i.e., scissors, tweezers, pliers, spoons, putty knife, etc.) that will be decontaminated, the following three bucket wash procedure should be performed, which is in general accordance with standard decontamination procedures defined in SESDPROC-205-R3 (EPA, 2015):

- In the first bucket, mix a residue free cleaning detergent (e.g., Alconox®), with distilled water to generate the recommended detergent concentration specified in the product directions;
- Fill the second bucket with distilled water;
- Fill the third bucket with distilled water;
- Clean the equipment in the first bucket with the cleaning detergent, then rinse in the second and then the third bucket. If the second bucket becomes slightly discolored during the rinse, change the contents of the second bucket with distilled water. Change the third bucket, if any dirt or material is observed in the water, since the third bucket needs to stay clean as it is the final rinse; and
- At the end of cleaning, let the equipment air dry in a clean area before use in sample collection. The rinse water should then be drummed and sampled for disposal. The planned disposal facility should be contacted to determine the required sample analysis for the rinse water characterization and profiling and that the disposal procedures comply with state and federal regulations.

If disposable sampling tools are used, the above decontamination procedures do not apply.

3.2.2 Sample Collection Frequency

For the four prioritized building materials, the following collection techniques and frequency should be followed.

Caulking

Three different types of caulking should be evaluated:

1. Window caulking;
2. Door frame caulking; and
3. Floor and expansion joint caulking.

For each type of caulking material identified, the following number of samples should be collected:

- Collect at least one sample from each homogenous area that contains less than 50 linear feet of caulking;
- Collect at least three samples from each homogenous area that contains between 50 and 250 linear feet of caulking;
- Collect at least five samples from each homogenous area that contains between 250 and 1,000 linear feet of caulking;
- Collect at least seven samples from each homogenous area that contains between 1,000 and 2,500 linear feet of caulking; and
- Collect at least nine samples from each homogenous area that contains greater than 2,500 linear feet of caulking.

If homogenous caulking material is found throughout the building, samples should be spatially distributed so as to not collect the required number of samples from one area. In addition, the width or cross-sectional area of the caulking bead is not relevant for determining the linear footage to be sampled. It is also recommended that the sampler performing the evaluation inspect the entire building prior to sample collection to insure proper distribution is performed.

Thermal/Fiberglass Insulation

For thermal/fiberglass insulation:

- Collect at least one bulk sample from each homogeneous area.

Adhesive/Mastic

For each type of adhesive/mastic material identified, the following number of samples should be collected:

- Collect at least three samples from each homogenous area less than 1,000 square feet;
- Collect at least five samples from each homogenous area between 1,000 and 5,000 square feet; and
- Collect at least seven samples from each homogenous area greater than 5,000 square feet.

If homogenous adhesive/mastic material is found throughout the building, samples should be spatially distributed so as to not collect the required number of samples from one area. It is

recommended that the sampler performing the evaluation inspect the entire building prior to sample collection to insure proper distribution is performed.

Rubber Window Seals/Gaskets

For rubber window seals/gaskets identified, the following number of samples should be collected:

- Collect at least one sample from each homogenous area that contains less than 50 linear feet of caulking (of any width or cross-sectional are of bead);
- Collect at least three samples from each homogenous area that contains between 50 and 250 linear feet of caulking;
- Collect at least five samples from each homogenous area that contains between 250 and 1,000 linear feet of caulking;
- Collect at least seven samples from each homogenous area that contains between 1,000 and 2,500 linear feet of caulking; and
- Collect at least nine samples from each homogenous area that contains greater than 2,500 linear feet of caulking.

If homogenous rubber window seals/gaskets are found throughout the building, samples should be spatially distributed so as to not collect the required number of samples from one area. It is also recommended that the sampler performing the evaluation inspect the entire building prior to sample collection to insure proper distribution is performed.

3.2.3 Sample Analysis and Preservation

Samples collected to evaluate building materials for PCBs should be analyzed for Aroclors by EPA Method 8082/8082A[12] by an accredited analytical laboratory. The minimum reporting limit should be 50 micrograms per kilogram (µg/kg) and the laboratory should be contacted before sampling to confirm minimum material volume required to meet the reporting limit objectives. A sample reporting limit of 50 µg/kg is well below the target management level of 50 mg/kg.

Samples should immediately be chilled in an ice cooler and then kept at 4 degrees Celsius (39.2 degrees Fahrenheit) or colder during storage and transportation to the laboratory. Proper chain-of-custody[13] procedures should be followed from the time the samples are collected until they are delivered to the laboratory for analysis. Holding times for EPA Method 8082/8082A are sample extraction within 14 days of sample collection and analysis of the extract within 40 days of

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[12] Provision C.12.f. requires that Permittees develop and implement or cause to be developed and implemented an effective protocol for managing materials with PCBs concentrations of 50 ppm. EPA Method 8082/8082A is an acceptable method to quantify PCBs. Analysis of PCBs congeners is not required to meet the permit requirement.

[13] Chain-of-custody is the procedure to document, label, store, and transfer samples to personnel and laboratories. For a detailed list of procedures, refer to the *Sample and Evidence Management*, Operating Procedure (SESDPROC-005-R2), January 29, 2013

extraction. However, PCBs are very stable in a variety of matrices and holding times may be extended to as long as one year. Once extracted, analysis of the extract should take place within 40 days.

3.2.4 Quality Assurance and Quality Control

For this program, general quality assurance and quality control (QA/QC) procedures will be utilized. The following checklist should be used by the contractor performing the evaluation:

- QA/QC Checklist:
  - Proper specified sampling equipment was used (pre-cleaned or other, stainless steel);
  - Proper decontamination procedures were followed;
  - Sampling collection spatial frequency was met;
  - A National Environmental Laboratory Accreditation Program (NELAP) laboratory was utilized;
  - Samples were received by the laboratory within proper temperature range;
  - Samples were extracted and analyzed within the method holding time for EPA Method 8082/8082A; and
  - Sample reporting limit met data quality objectives.

3.3 Reporting and Notifications

The following considerations are applicable to reporting and notification:

- Assessment results must be submitted to the applicable Permitting Authority by the project applicant;
- Applicants that determine PCBs exist in priority building materials must follow applicable federal and state laws. This may include reporting to USEPA, the San Francisco Bay Regional Water Quality Control Board, and the California Department of Toxic Substances Control (DTSC). These agencies may require additional sampling and abatement of PCBs.
- Depending on the approach for sampling and removing building materials containing PCBs, applicants may need to notify or seek advance approval from USEPA before building demolition. Even in circumstances where advance notification to or approval from USEPA is not required before the demolition activity, the disposal of PCBs waste is regulated under TSCA.
- The disposal of PCBs waste is subject to California Code of Regulations (CCR) Title 22, Section Division 4.5, Chapter 12, Standards Applicable to Hazardous Waste Generators.

- Building owners and employers need to consider worker and public safety during work involving hazardous materials and wastes including PCBs.

For further information, applicants should refer to the *PCBs in Priority Building Materials Screening Assessment Applicant Package*, BASMAA, July 2018.

4. REFERENCES

Guidelines for Asbestos Sampling:

- https://www.epa.gov/asbestos/asbestos-laws-and-regulations

Guidelines for Lead-Based Paint Evaluations:

- Environmental Protection Agency (EPA) - Created the Renovation, Repair, and Painting (RRP) Rule which requires training and certification for anyone working for compensation in pre-1978 residential structures, day care centers, and schools where known or assumed lead-based paint is impacted. The EPA website with complete information on this regulation is https://www.epa.gov/lead/renovation-repair-and-painting-program.
- California Department of Public Health (CDPH) - Created "Title 17" which includes lead testing and abatement provisions in residential and public structures in California. Several important definitions are contained in Title 17 including Abatement, Clearance Inspection, Containment, Lead-Based Paint.
- Lead Contaminated Dust and Soil, Lead Hazard, and Lead Hazard Evaluation. Title 17 establishes that lead testing be performed using XRF equipment or by paint chip sample analysis in California. Lead test kits are not accepted. It also establishes testing in California be performed by a State certified lead inspector/assessor if the testing is related to a project involving compensation.
- Department of Housing and Urban Development (HUD) - Created the HUD Guidelines which contain protocols for lead testing and abatement.

EPA Method 8082A – Polychlorinated Biphenyls (PCBs) by Gas Chromatography

- https://www.epa.gov/sites/production/files/2015-07/documents/8082a.pdf

SESDPROC-205-R3, *Field Equipment Cleaning and Decontamination*, replaces SESDPROC-205-R2. December 18, 2015

- https://www.epa.gov/sites/production/files/2016-01/documents/field_equipment_cleaning_and_decontamination205_af.r3.pdf

SESDPROC-005-R2, *Sample and Evidence Management*, Operating Procedure, January 29, 2013

- https://www.epa.gov/sites/production/files/2015-06/documents/Sample-and-Evidence-Management.pdf

APPENDIX A

PCBs Building Material Prioritization Worksheet

Appendix A - PCBs Building Materials Prioritization

Material	Material Class	Median/Average/Single Reported Concentration (ppm)	Minimum (ppm)	Maximum (ppm)	PCBs Source Material? (Rating values: source = 5, or not source = 1)	Concentration (Rating values: 1 to 5, higher value means higher concentration)	Prevalence of PCBs Containing Material in Buildings (Rating values: high = 5, medium = 3, or low = 1)	Ease of Removal (Rating values: 1 to 5, higher value means easier to remove)	Flaking/ Crumbling (Rating values: 1 to 5, higher value means more likely to flake/crumble)	PCBs Removed by Other Waste Program? (Rating values: not removed by other = 5, or removed = 1)	Prioritization Score
Caulking (sealant, plaster)	**Caulk/sealant/tape/glue**		**0.001**	**752,000**	**5**	**5**	**5**	**3**	**5**	**5**	**4.67**
Thermal insulation	**Insulation**			**73,000**	**5**	**5**	**5**	**4**	**4**	**5**	**4.67**
Fiberglass insulation	**Insulation**			**39,158**	**5**	**4**	**5**	**4**	**4**	**5**	**4.50**
Adhesives/mastic	**Caulk/sealant/tape/glue**			**3,100**	**5**	**3**	**5**	**3**	**5**	**5**	**4.33**
Rubber gaskets	**Gaskets/Rubber**			**84,000**	**5**	**5**	**3**	**3**	**4**	**5**	**4.17**
Wool felt gaskets	Gaskets/Rubber			688,498	5	5	3	3	4	5	4.17
Cloth/paper insulating material	Insulation			12,000	5	4	3	4	4	5	4.17
Foam rubber insulation	Insulation			13,100	5	4	3	4	4	5	4.17
Ceiling tiles coated w/flame resistant sealant	Internal nonstructural surface		53	110,000	5	5	5	3	2	5	4.17
Backer rod	Caulk/sealant/tape/glue			99,000	1	5	5	3	5	5	4.00
Roofing/siding material	External nonstructural surface		0	30,000	5	4	5	3	2	5	4.00
Paint (complete removal)	Paint/pigment/coatings		0.001	97,000	5	5	5	1	3	5	4.00
Insulating materials in electric cable	Electrical		0	280,000	5	5	3	4	1	5	3.83
Adhesive tape	Caulk/sealant/tape/glue			1,400	5	3	1	3	5	5	3.67
Surface coating	Paint/pigment/coatings			255	5	3	5	1	3	5	3.67
Coal-tar enamel coatings	Paint/pigment/coatings			1,264	5	3	5	1	3	5	3.67
Grout	Caulk/sealant/tape/glue			9,100	5	4	1	2	5	5	3.67
Cove base	Internal nonstructural surface			170	5	3	3	4	2	5	3.67
Plastics/plasticizers	Electrical			13,000	5	4	3	3	1	5	3.50
GE silicones	Caulk/sealant/tape/glue	<1.9	0	1.8	5	1	3	2	5	5	3.50
Glazing	Caulk/sealant/tape/glue	Up to 100% liquid PCBs		51	5	2	3	3	3	5	3.50
Flooring and floor wax/sealant	Internal nonstructural surface	Maximum likely >50		51	5	2	3	3	2	5	3.33
Light ballast	Light ballasts	Minimum likely <50	49	1,200,000	5	5	3	5	1	1	3.33
Anti-fouling compounds	Paint/pigment/coatings			59,000	5	4	1	1	3	5	3.17
Polyurethane foam (furniture)	Caulk/sealant/tape/glue			50	5	2	1	5	5	1	3.17
Askarel fluid/cutting oils/hydraulic fluid	Oils/dielectric fluids			450,000	5	5	1	5	2	1	3.17
Fire retardant coatings	Paint/pigment/coatings			59,000	5	4	1	1	3	5	3.17
Waterproofing compounds	Paint/pigment/coatings			59,000	5	4	1	1	3	5	3.17
Electrical wiring	Electrical			14	5	1	3	4	1	5	3.17
Concrete	Concrete/stone	2.5	0.001	17,000	1	4	3	1	4	5	3.00
Foam rubber	Gaskets/Rubber			1,092	1	3	1	3	4	5	2.83
Soil/sediment/sand	Soil/dust	0.15	0.001	581	1	3	1	2	5	5	2.83
Brick/mortar/cinder block	Concrete/stone			1,100	1	3	3	1	4	5	2.83
Wood	Wood			380	1	3	3	3	2	5	2.83
Door frame	Internal nonstructural surface			102	1	2	3	4	2	5	2.83
Metals surfaces in contact with caulk/sealant	Metal surfaces	448	51	448	1	3	1	2	4	5	2.67

Appendix A - PCBs Building Materials Prioritization

Material	Material Class	Median/Average/Single Reported Concentration (ppm)	Minimum (ppm)	Maximum (ppm)	PCBs Source Material? (Rating values: source = 5, or not source = 1)	Concentration (Rating values: 1 to 5, higher value means higher concentration)	Prevalence of PCBs Containing Material in Buildings (Rating values: high = 5, medium = 3, or low = 1)	Ease of Removal (Rating values: 1 to 5, higher value means easier to remove)	Flaking/ Crumbling (Rating values: 1 to 5, higher value means more likely to flake/crumble)	PCBs Removed by Other Waste Program? (Rating values: not removed by other = 5, or removed = 1)	Prioritization Score
Asphalt	Concrete/stone			140	1	2	1	2	4	5	2.50
Carpet	Internal nonstructural surface		0.46	9.7	1	1	1	5	2	5	2.50
Stone (granite, limestone, marble, etc.)	Concrete/stone			130	1	2	1	1	4	5	2.33
Air handling system	Air system		0.46	9.7	1	1	1	3	1	5	2.00

APPENDIX B

Priority Building Materials

Photographic Log

Appendix B

Priority Building Materials to be Tested for PCBs

Photograph 1

<u>Window Caulking</u>:

Damaged caulking around a window.

Photograph 2

<u>Window Caulking</u>:

Worn and potentially friable caulking around a window.

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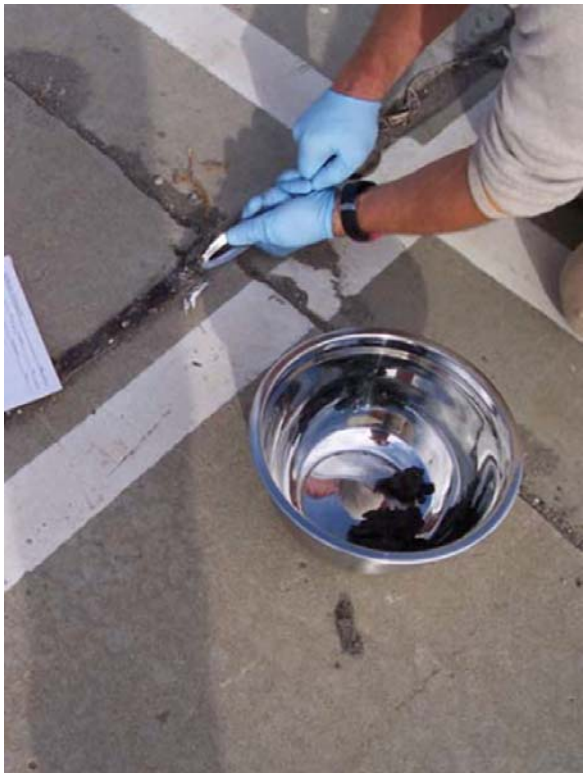
Priority Building Materials to be Tested for PCBs

Photograph 3	
<u>Door Frame Caulking</u>: **Damaged, friable caulking on an interior door frame.**	
Photograph 4	
<u>Floor and Expansion Joint Caulking</u>: **Joint compound between flooring segments.**	

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Priority Building Materials to be Tested for PCBs

Photograph 5	
<u>Thermal Insulation</u>: **Foam insulation material in an attic.**	

Photograph 6	
<u>Thermal Insulation</u>: **Damaged floor foam insulation.**	

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Priority Building Materials to be Tested for PCBs

Photograph 7	
<u>Thermal Insulation</u>: **Damaged pipe foam insulation.**	
Photograph 8	
<u>Thermal Insulation</u>: **Exposed/damaged pipe insulation.**	

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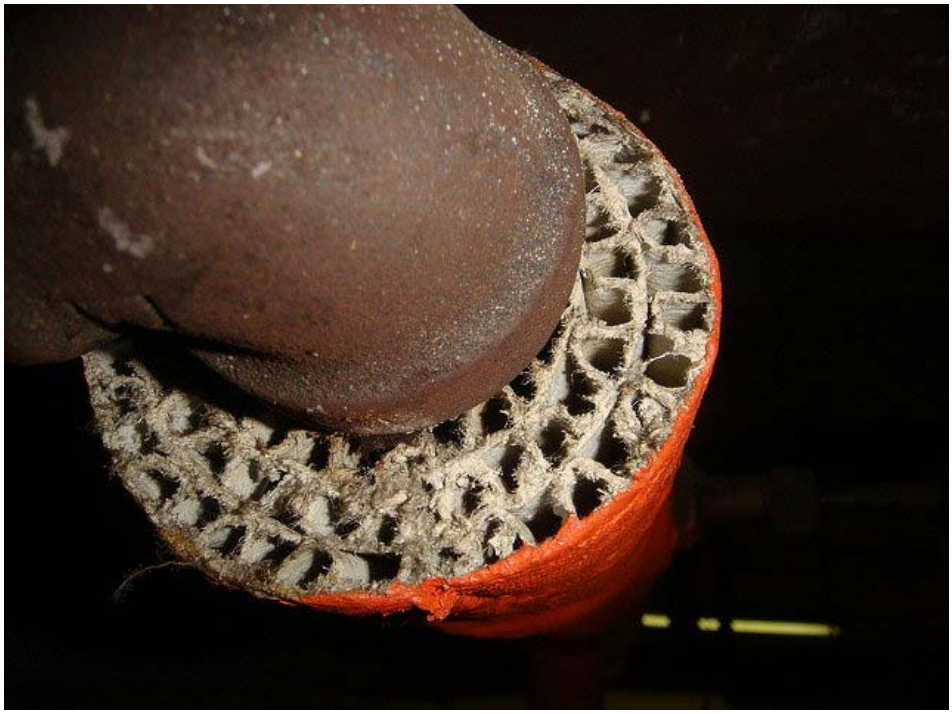
Priority Building Materials to be Tested for PCBs

Photograph 9	
<u>Thermal Insulation</u>: **Damaged pipe insulation.**	
Photograph 10	
<u>Thermal Insulation</u>: **Exposed pipe insulation.**	

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Priority Building Materials to be Tested for PCBs

Photograph 11	
<u>Adhesive / Mastic</u>: **Friable adhesive on a cement surface.**	

Photograph 12	
<u>Adhesive / Mastic</u>: **Adhesive beneath a carpet.**	

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Priority Building Materials to be Tested for PCBs

Photograph 13	
<u>Adhesive / Mastic:</u> **Adhesive remnants on flooring.**	

Photograph 14	
<u>Adhesive / Mastic:</u> **Exposed adhesive on roofing.**	

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Priority Building Materials to be Tested for PCBs

Photograph 15	
<u>Rubber Window Seal/Gasket:</u> **Grey rubber window seal/gasket in a wood type frame.**	

Photograph 16	
<u>Rubber Window Seal/Gasket:</u> **Off white rubber window seal/gasket in an aluminum type frame.**	